

The NAC Innovator

National Automotive Center Technical Outreach

Paving the Way

Welcome to the inaugural issue of the National Automotive Center's quarterly outreach publication, **The Innovator**. As Commander of the U.S. Army Tank-automotive and Armaments Command (TACOM), it is my pleasure to introduce the NAC's newest communication vehicle. First, let me tell you about TACOM and how the NAC is an integral part of this organization.

TACOM provides the soldier with the full range of equipment, mobility, and firepower needed to win on today's battlefields and throughout the world in keeping and promoting peace. It manages six distinct product lines that include all of the military's tracked and wheeled vehicles, small caliber arms, artillery, and chemical defense systems as well as boats, watercraft, and rail. TACOM's products support our troops in 119 countries throughout the world and are supplied by over 2,000 contractors from across the nation.

TACOM's workforce, its greatest asset, operates in a leaner, integrated business environment utilizing innovative commercial business processes to bring these systems through technology generation, application, and acquisition to fielding.



Major General Roy E. Beauchamp
Commander,
U.S. Army Tank-automotive & Armaments Command

The Tank Automotive Research, Development and Engineering Center (TARDEC) is one of TACOM's two R&D centers. It is America's principal laboratory for the design, development, and support of tank-automotive vehicles, bridging, logistic support products, fuels and lubricants, and mechanical countermine equipment. A key mission is to leverage advanced automotive technology to provide our soldiers with the world's most technologically superior ground vehicle systems. Experience shows that a dynamic synergy exists between the technology needs of the commercial automotive industry and the military. With this understanding, the National Automotive Center (NAC) was formed in 1992 to serve as the Defense Department's lead, and TARDEC's focal point, for the collaborative development of dual-needs automotive component and process technologies between the commercial and military sectors.

The NAC works to accelerate the implementation of dual-use technologies to military ground vehicles by networking and fostering relationships with industry, academia, and other government agencies. It enters into partnerships where the opportunities exist to collaborate and share R&D costs. The NAC's strategy for execution of their mission focuses around five major technical programs: Fuel Efficiency, Automotive Vehicle Modernization, Automotive Crew Safety Enhancement, Automotive Maintenance and Logistics Improvement, and Automotive Manufacturing Innovation. Each of these programs will be highlighted in **The Innovator**.

Every day, the soldier is the ultimate customer for TACOM, TARDEC, and the NAC. Without compromise to quality and safety, it is this commitment that leads to the rapid transition of the finest technology to enhance the readiness of our operational force for the Army After Next. The NAC's newest outreach publication will strive toward this goal. It will serve to broaden, facilitate, and strengthen communications between the NAC and you, the reader.

So sit back, relax, and take a spin around **The Innovator**. I think you will have a pleasant and informative tour.



Jerry Chapin
Director, Tank Automotive Research, Development and Engineering Center

As TACOM's Director of the Tank Automotive Research, Development and Engineering Center (TARDEC), I am pleased to welcome you to the first issue of **The Innovator**.

TARDEC is the automotive research arm of TACOM and the NAC's parent organization. With the responsibility for overall ground vehicle technology and integration, TARDEC supports every primary tracked and wheeled vehicle system in our military forces. Worldwide, the readiness and capability of the American soldier, depends on its commitment to improve the performance and endurance of these systems. TARDEC's mission extends to the design and development of military bridging, fuels, lubricants and water technologies, as well as mechanical countermine and specialized logistic equipment. Its state-of-the-art laboratories include Simulation, Concepts, Perception, Fuels and Lubricants, Water Purification, Vetronics

(See **CHAPIN**, page 2)



Dennis Wend
Director, National Automotive Center

It has been my pleasure to serve as Director of the National Automotive Center since 1995. Each year has brought the NAC new challenges and new opportunities to stimulate technology exchange among the Department of Defense (DOD), industry and academia. In 1997, the NAC began management of TACOM's Dual Use Science and Technology (DUS&T) program, formerly known as the Dual Use Application Program (DUAP). This program was designed to promote 50-50 partnerships between DOD agencies and industry for investment in science and technology programs that can be expected to return benefits to both. Recognizing that the nation can no longer afford to maintain two distinct industrial bases, the dual use science and technology initiative is removing the barriers that separate the defense and commercial sectors.

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Down the Road



COMmercially BAseD Tactical Truck



The automotive industry wants cost-effective improvements in off-road vehicle technology. So does the Army! Finding a way to satisfy those needs – without ignoring global competition, reduced budgets, and political considerations is quite a challenge. But, the driving concept behind the National Automotive Center is to do just that—identify the dual needs of government and industry and then forge partnerships that will provide innovative new technologies, meeting everyone’s needs.

The Commercially Based Tactical Truck (COMBATT) program is clearly a solid government/industry partnership that merges military and commercial needs! For the National Automotive Center, COMBATT provides the answer to leveraging off-road vehicle technologies from industry. For industry, it provides access to the technology behind what many say is the best off-road vehicle ever developed – the HMMWV. COMBATT is one

example of the NAC leveraging automotive technologies from industry to take advantage of economies of scale.

Leveraging off the vastly improved off-road commercial trucks, the program seeks to demonstrate to the Army a modified vehicle with the off-road performance of the HMMWV plus considerably reduced acquisition and operation and support (O&S) costs. The HMMWV was developed in the 1980s and has been used by the Army ever since mostly in tactical situations but also in offensive situations with weapons installed, i.e., Tube-Launched, Optically-Tracked, Wire Command-Link Guided (TOW) missiles and automatic weapons. It remains one of the Army’s most successful off-road light vehicles.

Cognizant of Army requirements, the NAC believes that commercially available light off-road vehicles have the potential to meet Army needs. The NAC provides the research and development (R&D) dollars and access to testing facilities and industry provides the vehicle prototypes and expertise. This program offers the Army several potential benefits: reduced ownership costs, economies of scale, access to the latest technology, and increased performance.

Undeniably the off-road standard, the HMMWV provides industry with an existing model for

vehicle performance. Having an existing model is important for obtaining test results quickly and efficiently. Among the current HMMWV performance requirements are some significant challenges, including payloads (up to 4500 lbs.) and soft soil mobility, but the COMBATT program rises to the challenge with a strong blend of Army and industry capabilities, researchers, funds, and facilities.

The COMBATT program was initiated as a result of ERIM International’s response to a National Automotive Center Broad Agency Announcement in 1997. ERIM proposed this effort as a Dual-Use Application Program (DUAP) [now called Dual Use Science and Technology program] in partnership with AM General, Chrysler, and Ford. For detailed information, see *Ride Sharing* in this issue.

At present the COMBATT core team is composed of representatives from the NAC, Chrysler, ERIM, and Ford, with support from suppliers including vendors of off-road racing components. Key government agencies are working together to assist in the analysis of performance and to develop solutions where needed. The intent is to find the absolute latest technology with an eye on the 2002 time frame.

A successful outcome to this program means that the Army will have modified a commercially available super duty pickup truck to perform as close to the HMMWV as economically feasible. Success also ensures significant design and performance improvements in the millions of future SUVs – vehicles in constant demand by a steadily growing and savvy commercial market.



CHAPIN (continued from page 1)

Integration Simulation, Virtual Prototyping, Propulsion, Track and Suspension, and Rapid Prototyping. A sampling of TARDEC’s special facilities includes a Computer Augmented Virtual Environment, a Department of Defense High Performance Computing Center, and Software Engineering Lab Bridge Load Frame.

The NAC is an integral part of TARDEC. It is an organization small in number, but large in mission. The NAC is the Defense Department’s lead, and TARDEC’s focal point, to leverage and develop dual needs automotive technologies in partnership with industry, academia and other government agencies. It concentrates on integrating commercial and military research and development efforts and technology insertion to improve the automotive performance of military ground vehicles.

The NAC’s dual-use technology research and development initiatives remove the barriers separating the defense industry from commercial industry. A principal program that NAC uses to promote this collaboration is the Dual Use Science and Technology (DUS&T) program. DUS&T initiatives use a structured process that fosters cost-shared programs with its partners. Another example of the NAC’s initiatives is the Automotive Research Center, which partners with several large universities and organizations such as Ford Motor Company, General Motors, and Chrysler Corporation. The evolving research and development will result in substantial benefits to all — eliminating duplicative efforts and combining physical and intellectual resources for a better-equipped Army and a more competitive American industrial base.

The NAC is continually looking for emerging technologies that offer potential application to both military vehicles and the commercial arena. **The Innovator** is your avenue to learn about the NAC, its programs and how you can do business with them. We welcome your comments and ideas for cooperative technology exchange.

WEND (continued from page 1)

The solicitation method used under the DUS&T program is a Broad Agency Announcement (BAA) which appears in the Commerce Business Daily (CBD) and on Service Agency web sites. The BAA provisions, general in nature, identify areas of research interest. It includes criteria for selecting proposals and solicits the participation of all offerors capable of satisfying the Government’s needs. Industry is normally invited to submit “white papers” on any of the topics covered in a BAA. These papers are reviewed, projects of interest identified, and later, organizations are requested to submit full proposals.

The contractual mechanism used for the resulting partnerships is a non-Federal Acquisition Regulation “Other Transaction.” The nature of the contractual instrument allows a true partnership arrangement. This atmosphere allows the Army and industry to focus almost totally on the research effort without the encumbrance of numerous regulatory constraints. By working together, a common commercial and defense industrial base better serves defense needs, enhances U.S. economic competitiveness, and provides U.S. industry with the benefit of larger combined markets.

The NAC uses the DUS&T program as a significant source of leveraging opportunities. In 1997, fourteen proposals were awarded funding for a total value of \$38,811,633, with industry providing \$20,791,283. A sampling of the type of technologies work that is ongoing under these proposals includes advanced diesel engine fuel injection, Smart Diagnostics and Repair Tool

(Smart DART), an automotive collaborative vehicle design framework, and a Commercially Based Tactical Truck (COMBATT).

This year, a total of \$56,190,983 will be awarded to eight DUS&T proposals and industry will provide \$29,404,304. We will soon join with several new industry partners to begin work in the areas of fuel efficiency, logistics and soldier safety, and simulation and collaborative design. Our expectations are high as we anticipate the start of new business relationships.

Inside each issue of **The Innovator** we’ll expand on the mix of contractual mechanisms that companies, large and small, can use to form partnerships with the NAC. Our Tool Chest columns will talk about the Small Business Innovation Research Program (SBIR), Cooperative Research and Development Agreements (CRADAs), and Other Transactions (OTs), and will provide additional information on the DUS&T program. We’ll provide you the points of contact to discuss your potential to join us in a unique business venture.

The NAC is constantly striving to expand our outreach to potential partners, as well as inform existing partners of new opportunities and notable accomplishments. We are committed to providing our military a decided edge in future systems capability from the “leap ahead” technologies that our commercial and academic partnerships develop. **The Innovator** is designed to be informative and interesting. We hope you enjoy it and invite your comments, as well as ideas, for improvements. Let me welcome you to this first issue.

AUTOMOTIVE RESEARCH CENTER **N**ews

The Automotive Research Center (ARC) is a University-based, Army-sponsored center of excellence for advancing technology for high fidelity simulation of military and civilian ground vehicles. Initially established by the National Automotive Center at the University of Michigan in 1994 in partnership with four other universities, today the ARC is comprised of the University of Michigan in partnership with Clemson University, Oakland University, University of Alaska, University of Iowa, University of Tennessee, University of Wisconsin, and Wayne State University.

The ARC's mission is to study and demonstrate the creation of a flexible, agile simulation system composed of a hierarchy of models of varying resolution that can be tailored to meet a range of simulation objectives and can significantly impact the product development process of military and commercial automotive manufacturers. The ARC's mission is pursued along three dimensions: Research, Technology Exchange/Deployment, and Education.

Currently, research is focused on the development of modular templates in five research thrust areas that fit together to create a

hierarchical modeling system. The five thrust areas include: Intelligent Vehicle Dynamics and Control; Synthetic Virtual Environments; High Efficiency Structures and Materials; Advanced and Hybrid Powertrains; and Integrated System Design and Simulation.

One of the ARC's greatest challenges is bridging the gap between the "mission pull" of the Army and the "technology push" of universities and industry. Therefore, the ARC promotes technology exchange by utilizing Research Quadruplet Units ("Quads") to facilitate all research projects. A Quad consists of a faculty principal, a graduate student or research fellow, an industry principal, and a TARDEC principal. The linking of research projects with commercial automotive activities and the government procurement process also addresses the issue of technology transfer. Additionally, each year the NAC and the ARC

sponsor a conference on ***Critical Technologies for Modeling and Simulation of Ground Vehicles.***

Both government and industry engineers and scientists are encouraged to work as research personnel within the Center and to pursue focused doctoral and masters degrees at the participating Universities. Additionally, the enormous success and interest of the ARC has spawned the University of Michigan's launch of a new professional Master's in Automotive Engineering degree program.

-Wendy Krill and Jim Overholt

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Ride Sharing

Dual Use Science and Technology

Dual-use is the logical starting place for developing new products. If the Army needs a better anti-lock braking system for Army and the automotive community wants to develop a better anti-lock braking system for sport utility vehicles, why should they both expend resources to research, develop, and invent a new system? They shouldn't! Dual Use Science and Technology encourages them to work together in order to save money, to share resources, and to reach their goals together. It's a win-win situation! The Army accomplishes this by developing partnerships between the NAC and commercial corporations and groups.

The Department of Defense strategy for implementing dual-use technology has evolved over the past few years, based on knowledge gained through innovative dual-use programs performed in partnership with the private sector. Acquisition reform prepared the legal, regulatory, and operational ground necessary to pursue changes in DOD investment strategies and practices. Building on these efforts, the dual-use approach will:

- ✓ Enable dual-use to become a widely accepted means of business interaction with the Services.
- ✓ Broaden the scope of dual-use to include all aspects of science and technology, new acquisition programs, and fielded systems.
- ✓ Accelerate response to rapidly arising user requirements.
- ✓ Expand the application of dual-use products and processes by developing and adopting better insertion strategies.
- ✓ Enhance the integration of civilian and military production in order to take advantage of the best practices and economies of scale inherent in commercial manufacturing.



The benefits for DOD are better products developed faster and at lower cost and a vigorous, productive, and competitive commercial industrial infrastructure which, when coupled with the superior systems integration capability and defense-unique technologies provided by defense contractors, will ensure a superior U.S. military.

The Dual Use Science and Technology program consists of three components designed to address different stages in the product life cycle.

- ✓ For basic research and technology development, a partnership between DOD and industry shares risk and helps ensure that the research results will benefit both parties. Dual Use Science and Technology (DUS&T) is a partnership between DOD and the private sector to co-develop technologies that benefit both partners.
- ✓ During the pre-production or early production stages of an acquisition program, additional funding to test and qualify a new technology may be required, although it had not been planned for when the system design was finalized.
- ✓ After the system goes into production and is fielded, new technologies can be utilized to significantly reduce operating and support costs. The Commercial Operational and Support Savings Initiative (COSSI) exploits these opportunities by retrofitting fielded systems with components adapted from commercial technologies.

Dual-use and dual-needs are terms you will hear more and more when working with the Department of Defense — especially if you team with the National Automotive Center.

**Ever heard the saying, "Two heads are better than one"?
That's exactly the logic used by Dual Use Science and Technology.**

Tool Chest

Small Business Innovation Research (SBIR)



Small businesses, large corporations, and venture capitalists should all pay attention to the SBIR program. Imagine — a government program that is easy to understand, beneficial to small businesses, invaluable to the Department of Defense, and whose results are enticing to investors and large corporations alike.

Established in 1982, the SBIR program has always been ahead of its time. It sets everyone up for success! The benefits are easy to identify. SBIR provides:

- funding to small businesses at an early stage in the product development process via an easy-to-understand contracting mechanism.
- technical points of contact who work with the small businesses to develop technologies needed by the government and of interest to the commercial market.
- opportunities for small businesses to demonstrate their technologies and market their innovations to larger corporations and venture capitalists.

The National Automotive Center (NAC) encourages all small business interested in research and development to participate in this program.



Why does NAC believe so strongly in this program? Because SBIR allows technological and scientific innovation to be funded at an early stage, because when all is said and done the company retains the patent rights for all new technologies, and because the process is easy to work with and easy to understand.

First, the government creates a solicitation book available on the Internet at <http://www.acq.osd.mil/sadbu/sbir/>. In this book, each Service provides information about potential research and development in which it is interested. The information is organized into distinct projects or topics. A topic discusses the Service need, all specifications, and ideas for potential commercial applicability. The solicitation book also provides guidance for preparing a proposal in response to the topics.

Once proposals are received, the SBIR program then works in a three phase process. The proposals are competitively reviewed and the winners are awarded Phase I contracts. These contracts allow the small business to study the feasibility of innovative concepts. Phase I awards are generally limited to six-month, \$100,000 efforts.

Successful Phase I efforts result in Phase II contracts for research, development, and prototype production. Phase II awards usually last two years with a funding ceiling of \$750,000.

Phase III culminates all SBIR initiatives. In Phase III, the product, process, or service developed in Phases I and II is marketed outside the program. Small firms achieve Phase III success by selling their products to the private sector or a government agency.

It's the commercialization aspect that is so exciting about this program. For example, KVH Industries, Inc. developed an electric compass that is used in the M1 Abrams tank. Commercially, this product is also compatible with the Global Positioning System (GPS) that most automotive corporations are beginning to install in passenger vehicles. The United States Marine Corps purchased \$1.5 million worth of these digital compasses for Operation Desert Storm. Additionally, KVH signed a contract for \$9.6 million to produce compasses for a fleet of 1,000 foreign vehicles.

KVH is now the leader in the electric compass industry. And success seems limitless as KVH is still exploring the full market potential of this product. All because this company took the first step and participated in SBIR at the National Automotive Center!

We invite you to learn more about how SBIR could benefit your company. Call NAC's point of contact, Alex Sandel at (810) 574-7545, email him at sandela@cc.tacom.army.mil, or visit the NAC web site at <http://www.tacom.army.mil/tardec/nac/partnering/index.htm>.

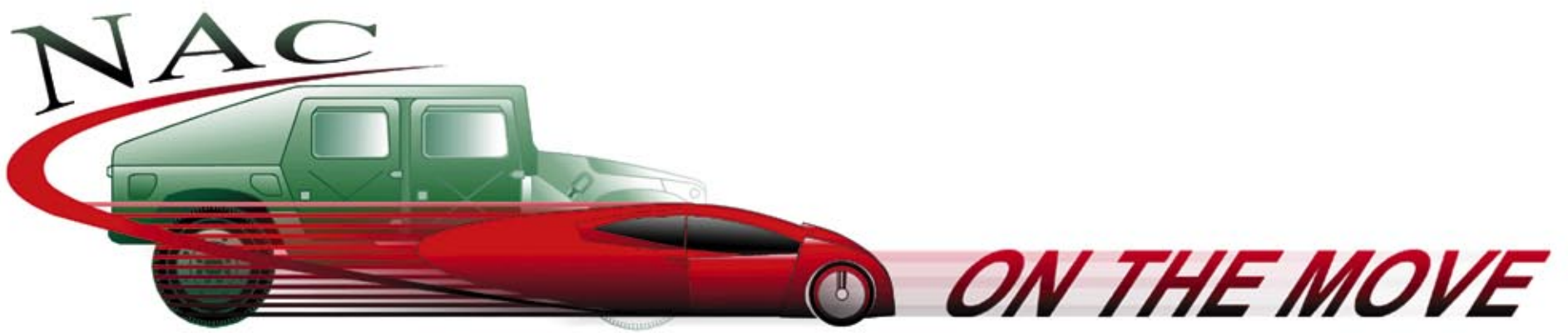


How do companies partner with the National Automotive Center? Do any pre-established programs exist? Are there any benefits to these programs? Have companies really had any success? These questions and many more will be answered in the Tool Chest each quarter.

Working with the government is much easier than people think. The Tool Chest will hammer out the details and smash the myths! In particular, we will focus on the Small Business Innovation Research Program (SBIR), Cooperative Research and Development Agreements (CRADAs), Cooperative Agreements, and other transactions. These contracting vehicles are very successful and we want to provide you with the information you need to succeed!

In this issue we focus on the SBIR program; in the next issue we will focus on the CRADA program; and then in subsequent issues we will provide information on Cooperative Agreements and other transactions as well as interesting updates and success stories.

Please keep in mind that this information is for your benefit — if you would ever like to see something specific in this column or if you have questions, please do not hesitate to contact us! Contact information is listed on the back of this document. We look forward to hearing from you!



Automotive technologies are moving quickly and the Army wants the Soldier to benefit from these advancements. At the same time, the Army recognizes that business and ultimately the general public can benefit from the military's innovative technological advancements. So strong and effective partnerships between military and industry will ensure that by sharing technology we remain in the forefront of innovation.

The National Automotive Center and its technical programs are structured in a way that is easily accessible and understandable to industry. This solid, well-thought-out structure makes it easy to identify potential partnerships and locate projects for which the NAC needs partners.

Therefore, the National Automotive Center has organized its automotive projects and resources into five technical areas, which correlate to many

of commercial industry's prominent objectives.

While these programs are closely connected to commercial objectives, the NAC technical programs also support and are directly related to Army XXI and Army After Next imperatives. For

businesses contemplating a partnership, the Army is extremely interested in:

- a lighter, faster, more mobile force
- significant reduction in logistic burden

- integrated data fusion from multiple sensors and intelligent decision-making aids for commanders at all levels
- countermeasure capabilities to protect the integrity/availability of information and source
- bioscience/human and organizational enhancement to improve soldier performance and capability
- power sources other than fossil fuels and batteries
- ultra-reliable systems

Contact the NAC to join us on our move toward the full implementation of our technical programs and the transfer of crucial technologies between the military and private industry.

The National Automotive Center Technical Programs

Fuel Efficiency Program

- Increase fuel efficiency and reduce emissions

Automotive Vehicle Modernization Program

- Enhance mobility and supportability

Automotive Crew Safety Enhancement Program

- Enhance crew safety, navigation, and communication capabilities

Automotive Maintenance and Logistics Improvement Program

- Reduce the cost of military ground vehicle ownership through operations and support, and production cost reduction-safety and environmental cost avoidance

Automotive Manufacturing Innovation Program

- Reduce automotive production costs

IN THE NEWS

BESTEA Passed by the House and Senate

The Building Efficient Surface Transportation and Equity Act (BESTEA) [P.L. 105-178] was passed by both the House of Representatives and the Senate. This legislative act:

- ✦ Provides \$11.9 million in funding — guaranteed from gas tax revenues.
- ✦ Promotes safety, streamlining, educational programs, and clean air.
- ✦ Ensures local community participation and flexibility.
- ✦ Funds a program to transport former welfare recipients to their places of employment.

Toyota and GM to Manufacture Inductive Charging System

Toyota and GM have agreed to jointly manufacture an inductive charging system.

- ✦ The collaboration will assist both companies in creating a more efficient and reliable means to transfer energy from the power source (charger) to the vehicle.
- ✦ Energy will be transferred through electromagnetic fields rather than plugs.
- ✦ Off-board charging components will enable the vehicle to remain lighter and less complex with improved reliability.



Join National Automotive Center representatives as they spread the word about NAC and its programs across the country - and around the world!!

Participation in conferences, trade shows, and symposia form the basis of the National Automotive Center’s outreach activities. The conferences listed below provide excellent opportunities to meet with NAC representatives.

Where we’ve been . . .



AUSA Annual Meeting ‘98
Washington, DC
October 12-14



1998 SAE International Truck & Bus Meeting & Exposition
Indianapolis, IN
November 16-18



Digital Avionics Systems Conference
Bellevue, WA
October 31- November 6



Interservice/Industry Training, Simulation and Education Conference (I/ITSEC ‘98)
Orlando, FL
November 30 - December 3

Where we’re going . . .



The National Automotive Center & Industry Simulation-Based Acquisitions Symposium
Van Dyke Park Hotel
Warren, MI
December 8

This symposium will provide a forum to discuss and observe emerging concepts and technologies that foster simulation-based acquisitions.



1999 SAE International Congress and Exposition (SAE ‘99)
Cobo Center
Detroit, MI
March 1-4, 1999

The SAE International Congress and Exposition is at the foundation of global automotive technology and SAE ‘99 is aimed at the center of the automotive industry. Over 45,000 professionals and nearly 1,400 suppliers representing the 300 billion dollar automobile industry will assemble at this exposition. The NAC will host two display areas at the exposition — Booth 1780 and Booth 735. Check the NAC website for more information: www.tacom.army.mil/tardec/nac/sae1999.htm.



- Q.** *Are there any opportunities for small businesses? How do we get involved with the NAC?*
- A.** The NAC welcomes partnerships with all companies — large and small. In fact, there are special government programs for small businesses involved in technology R&D. The NAC plays a large part in the U.S. Army Small Business Innovation Research (SBIR) program, which provides a valuable entry mechanism for the small business. For more information about this program, read the *Tool Chest* on Page 4.
- Q.** *How can we find out more about what the NAC is developing, what it is working on, and what kind of technologies it might be interested in?*
- A.** Learning about the NAC and our projects is easy — in fact, we work

- very hard at providing a variety of informational resources. You can:
1. Browse our web site at: <http://www.tacom.army.mil/tardec/nac/index.htm>
 2. Receive future copies of this outreach document! Look below for information about contacting our staff to ensure that you are on the mailing list.
 3. Come visit our representatives at a trade show or conference. Look in the *Off Road* section of this document for more information about upcoming events.
 4. Look for future BAAs (Broad Agency Announcements). These documents provide detailed information about technologies in which the NAC is interested.
- If you have a question, please email it to: piotrown@cc.tacom.army.mil

Down the Road...

Winter 1999 Issue
“Fuel Efficiency”

- DOD and Academic Perspectives on Fuel Efficiency
- 21st Century Truck Initiative
- Automotive Research Center (ARC) Projects
- Informative Updates on DUS&T
- CRADA Overview

The Innovator is a technical outreach document distributed by the National Automotive Center (NAC), the Nation’s unique laboratory for the development and execution of collaborative research. By fostering relationships and forming cost-shared partnerships, the NAC accelerates the exchange and implementation of automotive technologies.

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